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(54) **Liquid crystal device and liquid crystal apparatus**

(57) A liquid crystal device is constituted by a pair of electrode plates and a liquid crystal composition disposed between the electrode plates. At least one of the electrode plates comprises a light-transmissive substrate, a plurality of electrodes including principal electrodes and auxiliary electrodes supported on the light-transmissive substrate, and an insulating layer. Each auxiliary electrode is disposed between an associated principal electrode and the light-transmissive substrate so as to be electrically connected with at least a part of the associated principal electrode, and the auxiliary electrodes being disposed with spacings therebetween which are filled with the insulating layer. The liquid crystal composition comprises at least one species of a fluorine-containing mesomorphic compound comprising a fluorocarbon terminal portion and a hydrocarbon terminal portion, the terminal portions being connected with a central core, and having smectic mesophase or latent smectic mesophase. The combination of the above specific cell structure and the specific liquid crystal compo-

sition is effective in improving display quality (e.g., contrast) while minimizing a voltage waveform deformation.

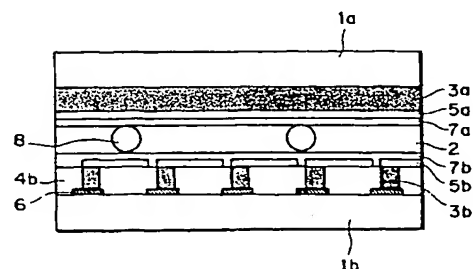


FIG. 1

EP 0 814 142 A3



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| DOCUMENTS CONSIDERED TO BE RELEVANT | | | |
|--|--|--|--|
| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (Int.Cl.6) |
| X A | US 4 728 176 A (TSUBOYAMA AKIRA ET AL) 1 March 1988 * the whole document * | 34, 35, 37, 38 1, 4-6, 16-21, 25-30, 39, 40 | C09K19/04 G02F1/1343 G02F1/1335 G02F1/1333 G02F1/141 |
| A | --- EP 0 646 636 A (MINNESOTA MINING & MFG) 5 April 1995 * example 46 * | 1, 11-15, 18, 27 | |
| D, A | --- EP 0 360 521 A (MINNESOTA MINING & MFG) 28 March 1990 * the whole document * | 1, 11, 13, 18, 27 | |
| D, A | --- WO 93 22396 A (MINNESOTA MINING & MFG) 11 November 1993 * the whole document * | 1, 12, 14 | |
| A | --- EP 0 255 236 A (MINNESOTA MINING & MFG) 3 February 1988 * claims 1, 3, 4; example 170 * | 1, 11, 13 | TECHNICAL FIELDS SEARCHED (Int.Cl.6) |
| X A | --- US 5 282 068 A (INABA YUTAKA) 25 January 1994 * column 2, line 47 - column 4, line 33; figure 6 * | 34, 35, 37, 38 25-27, 29-33 | C09K G02F |
| X A | --- US 4 712 874 A (SEKIMURA NOBUYUKI ET AL) 15 December 1987 * column 2, line 45 - column 4, line 65 * * column 9, line 1 - line 17 * | 34-38 16-21, 24-30, 33 | |
| | --- -/-- | | |
| The present search report has been drawn up for all claims | | | |
| Place of search THE HAGUE | | Date of completion of the search 18 September 1998 | Examiner Stang, I |
| CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document | | T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons A : member of the same patent family, corresponding document | |

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| DOCUMENTS CONSIDERED TO BE RELEVANT | | | |
|--|--|--|--|
| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (Int.Cl.6) |
| X | PATENT ABSTRACTS OF JAPAN vol. 016, no. 247 (P-1365), 5 June 1992 -& JP 04 055823 A (MATSUSHITA ELECTRIC IND CO LTD), 24 February 1992 | 34, 35, 37-40 | |
| A | * abstract; figures 1, 3 * | 16, 19, 21, 25, 28, 30 | |
| X | PATENT ABSTRACTS OF JAPAN vol. 014, no. 422 (P-1104), 12 September 1990 -& JP 02 165121 A (SEIKO EPSON CORP), 26 June 1990 | 34-38 | |
| A | * abstract * | 16, 21, 22, 25, 30, 31 | |
| A | EP 0 473 168 A (CANON KK) 4 March 1992 * page 5, line 41 - page 6; figure 3 * | 16, 20-25, 29-31, 33 | TECHNICAL FIELDS SEARCHED (Int.Cl.6) |
| A | PATENT ABSTRACTS OF JAPAN vol. 017, no. 076 (P-1487), 16 February 1993 & JP 04 280227 A (FUJI PHOTO FILM CO LTD), 6 October 1992 * abstract * | 25, 26, 29-31 | |
| The present search report has been drawn up for all claims | | | |
| Place of search THE HAGUE | | Date of completion of the search 18 September 1998 | Examiner Stang, I |
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